Species at Risk Act
Recovery Strategy Series

Recovery Strategy for the American Water-willow (*Justicia americana*) in Canada

American Water-willow

2011

Parks Canada Parcs Canada

Canada

About the *Species at Risk Act* Recovery Strategy Series

What is the *Species at Risk Act* (SARA)?

SARA is the Act developed by the federal government as a key contribution to the common national effort to protect and conserve species at risk in Canada. SARA came into force in 2003 and one of its purposes is to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity.

What is recovery?

In the context of species at risk conservation, **recovery** is the process by which the decline of an endangered, threatened or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of the species' persistence in the wild. A species will be considered **recovered** when its long-term persistence in the wild has been secured.

What is a recovery strategy?

A recovery strategy is a planning document that identifies what needs to be done to arrest or reverse the decline of a species. It sets goals and objectives and identifies the main areas of activities to be undertaken. Detailed planning is done at the action plan stage.

Recovery strategy development is a commitment of all provinces and territories and of three federal agencies — Environment Canada, Parks Canada Agency, and Fisheries and Oceans Canada — under the Accord for the Protection of Species at Risk. Sections 37-46 of SARA (www.sararegistry.gc.ca/the_act/default_e.cfm) outline both the required content and the process for developing recovery strategies published in this series.

Depending on the status of the species and when it was assessed, a recovery strategy has to be developed within one to two years after the species is added to the List of Wildlife Species at Risk. Three to four years is allowed for those species that were automatically listed when SARA came into force.

What's next?

In most cases, one or more action plans will be developed to define and guide implementation of the recovery strategy. Nevertheless, directions set in the recovery strategy are sufficient to begin involving communities, land users, and conservationists in recovery implementation. Cost-effective measures to prevent the reduction or loss of the species should not be postponed for lack of full scientific certainty.

The Series

This series presents the recovery strategies prepared or adopted by the federal government under SARA. New documents will be added regularly as species get listed and as strategies are updated.

To learn more

To learn more about the *Species at Risk Act* and recovery initiatives, please consult the SARA Public Registry (http://www.sararegistry.gc.ca/) and the web site of the Recovery Secretariat (http://www.speciesatrisk.gc.ca/recovery/default_e.cfm).

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DECLARATION

Under the *Accord for the Protection of Species at Risk* (1996), the federal, provincial and territorial governments agreed to work together on legislation, programs and policies to protect wildlife species at risk throughout Canada. The *Species at Risk Act* (S.C. 2002, c.29) (SARA) requires that federal competent ministers prepare recovery strategies for listed Extirpated, Endangered and Threatened species.

The Minister of the Environment presents this document as the recovery strategy for the American Water-willow as required under SARA. It has been prepared in cooperation with the jurisdictions responsible for the species, as described in the Preface. The Minister invites other jurisdictions and organizations that may be involved in recovering the species to use this recovery strategy as advice to guide their actions.

The population and distribution objectives and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new findings and revised objectives.

This recovery strategy will be the basis for one or more action plans that will provide further details regarding measures to be taken to support protection and recovery of the species. Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the actions identified in this strategy. In the spirit of the *Accord for the Protection of Species at Risk*, all Canadians are invited to join in supporting and implementing this strategy for the benefit of the species and of Canadian society as a whole. The Minister of the Environment will report on progress within five years.

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STRATEGIC ENVIRONMENTAL ASSESSMENT

In accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals* (2004), a strategic environmental assessment (SEA) is conducted on all SARA recovery strategies. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans and program proposals to support environmentally-sound decision making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts on non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below.

By promoting the recovery of the American Water-willow, this Recovery Strategy will clearly benefit the environment,contributing to:

- a better understanding of the ecology of this species in Canada, of the habitat-related requirements of this species and of threats to its survival;
- the protection and conservation of American Water-willow populations;

- greater public awareness about this species and SARA and a greater sharing of information with affiliated partners.

There is little likelihood that the activities planned in order to meet the recovery strategy objectives will be harmful to the environment to any significant extent, for they are centred primarily on the protection and restoration of critical habitat, recovery of the species and public awareness. This recovery strategy describes the threats currently confronting the American Water-willow and its habitat, (section 1.5) existing knowledge gaps (section 1.7) and the population and distribution objectives (section 2.1) that are explicitly aimed at addressing these threats and filling in these gaps.

Furthermore, some activities might well benefit – though unintentionally – species that are not targeted under this strategy. It is in fact fieldwork (trampling) that presents the strongest risk for negatively impacting the environment; but, such effects can be avoided or at least kept to a minimum by employing known techniques and proper practices in the field.

Some potential recovery activities, such as augmentation of individuals in a population may entail performing an environmental assessment for each project under the provisions of the *Canadian Environmental Assessment Act* (CEAA, S.C. 1992, ch. 37).

In short, the SEA concluded that this strategy will clearly benefit the environment and will not result in any significant adverse effects.

RESIDENCE

SARA defines residence as: *a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating* **[Subsection 2(1)]**.

Residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SARA Public Registry: http://www.sararegistry.gc.ca/plans/residence_e.cfm.

PREFACE

This recovery strategy addresses the recovery of the American Water-willow. In Canada, the species ranges from southern Ontario to southwestern Quebec near the shores of waterways.

The *Species at Risk Act* (SARA, Section 37) requires the competent minister to prepare recovery strategies for listed Extirpated, Endangered or Threatened species. The American Water-willow was listed as Threatened under SARA in May 2000. The Parks Canada Agency led the development of this recovery strategy. This recovery strategy was realized in collaboration with the ministère du Développement Durable de l'Environnement et des Parcs du Québec (MDDEP), the Ontario

Ministry of Natural Resources (OMNR), and Environment Canada (Ontario and Quebec regions). All responsible jurisdictions reviewed and supported posting of the proposed strategy. The proposed strategy meets *SARA* requirements in terms of content and processes (Sections 39-41) and fulfills commitments of all jurisdictions for recovery planning under the *Accord for the Protection Species at Risk in Canada*. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

EXECUTIVE SUMMARY

In May 2000, the American Water-willow (*Justicia americana*) was determined to be a Threatened species in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). It was added to Schedule 1 of the *Species at Risk Act* in June 2003 by the Minister of the Environment upon recommendation from COSEWIC. The range of this species is confined to eastern North America, with its northern limit in Canada being restricted to southern Quebec and southern Ontario.

The American Water-willow is an aquatic plant inhabiting the shorelines of lakes and rivers. In Canada, the large majority of the species' population is located at one site: Rivière des Mille Îles in Quebec. Eighteen of the species' 28 known occurrences in Canada are either historical or extirpated. Its current range in Canada has been impacted primarily by the loss of habitat resulting from the dredging of the St. Lawrence Seaway in Quebec and possibly by fluctuations in the Lake Erie water levels in Ontario.

There are a number of gaps in knowledge concerning the American Water-willow – in particular, its general ecology and an absence of studies on Canada's populations and their genetic and reproductive characteristics. Little is known about the species' presence at other potential sites located between Lake Erie and the St. Lawrence River. The major threats to the plant are linked with changes in water regime (water level fluctuations), loss of habitat through erosion and infilling and, at some sites, alien invasive plants and trampling.

The limited number of confirmed extant sites (three in Quebec and seven in Ontario), combined with the small area occupied by some American Water-willow populations justifies the implementation of recovery measures. One or more action plans will be completed by January 2016.

The population and distribution objective is to maintain (and if possible increase) the current number of individuals within existing populations, the actual number of locations (10) and to prevent the decline in the quality of habitat. This objective will be achieved by conserving the existing populations at all the sites where the species is already found, in order to ensure the survival of the greatest number of individuals possible and also possibly by increasing the number of individuals at these known sites. For effective long term management, it is vital to identify demographic trends, which in turn will entail monitoring the main populations over a period of several years.

Based upon the best available information, the present recovery strategy provides an identification of the species' critical habitat for 17 critical habitat parcels at 10 locations.

RECOVERY FEASIBILITY SUMMARY

There are gaps in our current knowledge of the American Water-willow; however, a lack of full scientific certainty does not constitute justification for postponing measures to prevent the reduction or loss of the species.

Recovery of the American Water-willow in Canada is deemed feasible based on the criteria set outlined by the Government of Canada (2009):

1) **Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.** Yes, reproductive individuals that could increase the population's growth rate currently exist in the wild within Canada and in a botanical garden (seed production and vegetative propagation were observed in a Quebec population; Montreal Botanical Garden; Guy Jolicœur, pers. comm., November 2006).

2) ***Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration*** Yes. Enough suitable habitat is available to support this species. There are few favourable sites left in the Montreal section of the St. Lawrence River, but many sites seemingly host sufficient available habitat for colonization by American Water-willow in the Ontario section of the river and on the Canadian side of Lake Erie.

3) **The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.** Yes. All known threats to the species or to its habitat range-wide can be avoided or mitigated through recovery actions. Significant threats to the species include water level fluctuations, loss and degradation of habitat, erosion, alien invasive plants, trampling of human origin and infilling. These threats can be effectively avoided or mitigated through: (1) the use of management and stewardship actions to protect and improve habitat; (2) education, research and monitoring to support conservation and management decisions and (3) increased protection of key sites.

4) **Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.** Yes. Awareness tools have been developed. For site conservation, efficient and adequate measures exist and are already in place at certain sites.

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1. BACKGROUND

1.1 Species Assessment Information from COSEWIC

Date of Assessment : May 2000

Common Name (population): American Water-willow

Scientific Name: *Justicia americana*

COSEWIC Status : Threatened

Reason for designation : This clonal aquatic plant inhabiting the shorelines of lakes and rivers is now only found at very few sites in certain localized regions of south-western Ontario and Quebec. It is affected by various factors such as fluctuations in water level.

Canadian Occurrence: Ontario, Quebec

COSEWIC Status History : The species was designated "Threatened" in April 1984. Its status was re-examined and confirmed in May 2000, with the last assessment based on an updated status report.

1.2 Description

The American Water-willow (*Justicia americana* (L.) Vahl) is an aquatic herbaceous perennial that grows in colonies. It is the only representative of the Acanthaceae family in Canada. The plant has an erect stem that may be branched or unbranched, rising to a height of 20 cm to 1 m from a large rhizome that creeps along the ground. The leaves are undivided, narrow and elongated in shape, and occur in opposite pairs along the stem. White or pale violet, tube-shaped flowers appear on long thin stalks that originate at the junction of the upper leaves with the main stem. The fruit is a capsule which contains two to four beige or light brown seeds (Environment Canada, 2006).

1.3 Population and Distribution

1.3.1 Global range and range in Canada

The American Water-willow's global range is part of eastern North America, extending from Texas and Georgia in the south to the southern regions of Quebec and Ontario in the north (Figure 1). Canada is home to less than 5 % of all the populations of American Water-willow. It is present at very few sites (10) in Canada where distance between sites ranges from 2.5 km to 950 km.

In Quebec, the American Water-willow is found along the St. Lawrence River near Montreal and Lake Saint-Pierre, while in Ontario, it grows along the north shore of Lake Erie and in the Thousand Islands area (Figure 2).

This species has always been rare in Canada. According to historic records, there were once 11 occurrences in Quebec and 17 in Ontario. At present, there are three confirmed extant occurrences in Quebec and seven in Ontario. The other populations are considered historic or extirpated (Natural Heritage Information Centre, NHIC, 2010; Jolicoeur et Couillard, 2007) as their occurrence at the site has not been recorded in at least 20 years.

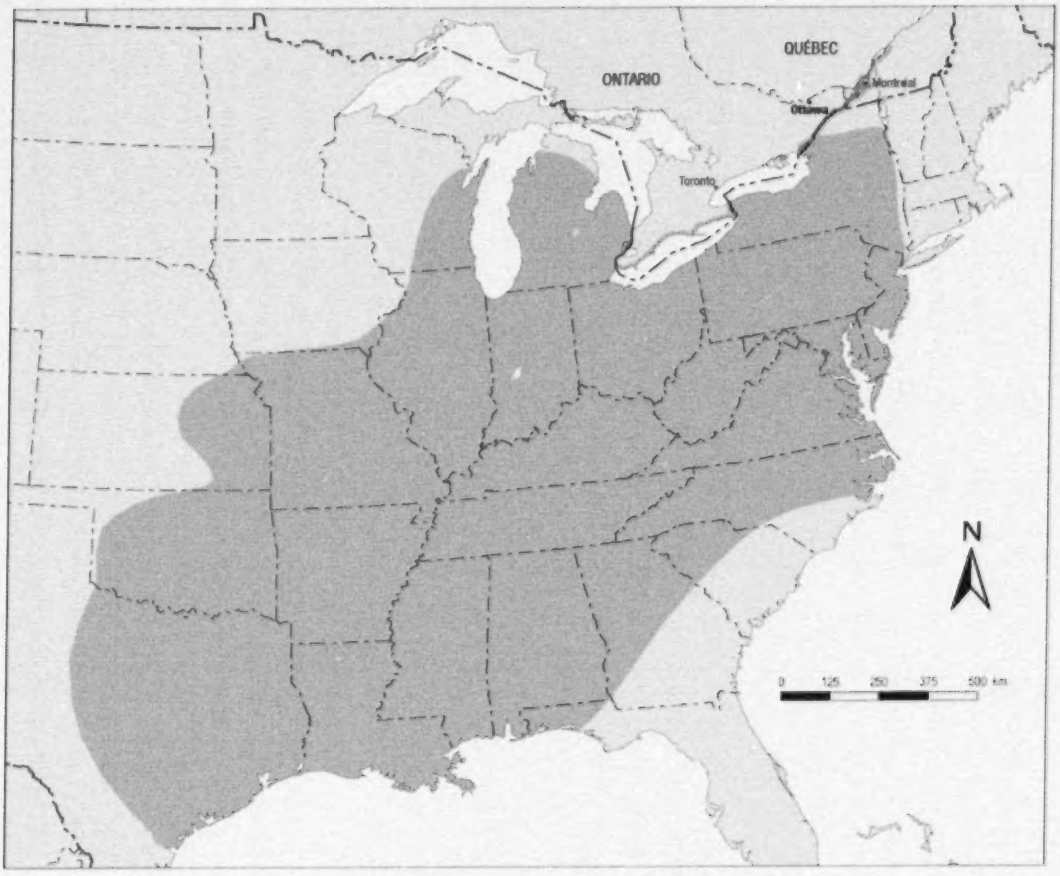

Figure 1: Global range of the American Water-willow [1]

[1] Gauvin (1983)

Figure 2: Distribution of extant and historic American Water-willow populations in Canada[2]

[2] Data sources: NHIC, 2010; White, 2000; Centre de données du patrimoine naturel du Québec, CDPNQ, 2006.

The American Water-willow has been designated as Threatened in April 1984 by the Committee on the Status of Endangered Wildlife in Canada and is listed since June 2003 on Schedule 1 of the *Species at Risk Act* (Environment Canada, 2006). It has been designated as Threatened according to Quebec law since 1998 (ministère du Développement durable, de l'Environnement et des Parcs, MDDEP, 2005; Quebec, 2003) and is designated as Threatened in Ontario in the Species at Risk Act in Ontario List regulation under Ontario's *Endangered Species Act, 2007* (Ontario Ministry of Natural Resources, 2009a). The American Water-willow's status[3] is G5, N5 in United States, N2 in Canada and S1 in Quebec and Ontario.

1.3.2 Population size and trends

Based on the most recent data issued in October 2007, the total number of American Water-willow stems in Canada is estimated to be 25,500,000 (NHIC, 2010; Centre de données du patrimoine naturel du Québec, CDPNQ, 2006; Bisson et Gauvin, 2008; Michael Oldham, pers. comm., September 2006). The most important population is found at Mille Îles River (Que.), where an in-depth inventory conducted by Éco-Nature (Bisson et Gauvin, 2008) counted as many as 25,323,757 stems in 2007, making up 99 % of all known stems counted in Canada.

In the U.S., colony density varies from 60 to 476 stems per m^2 (Howell, 1975), whereas at the northern limit of the species' range, this density ranges from 30 to 185 stems per m^2 in Quebec (CDPNQ, 2006) and 30-150 stems per m^2 (Thompson, 2008) in Ontario.

In Quebec, it is believed that urban expansion in the greater Montreal area and dredging for the St. Lawrence Seaway contributed to the species' disappearance from most sites (Jolicœur and Couillard, 2007). In Ontario, it is not known if the species was more abundant than it is now at these known occupied sites, except perhaps for Dufferin Island (near the Niagara River) and Point Pelee National Park, where historic data suggest that this was the case (Michael Oldham, pers. comm., December 2006, Varga, 1984).

In Point Pelee National Park, where several inventories were conducted over the years, numbers of stems have varied greatly and, overall, show a decline. The 2007 data (Jalava et al. 2008) suggests a large decline since 1983 (Varga, 1984; Kraus, 1991, Mouland, pers. comm. in White, 2000). One historic occurrence (last noted in 1990) at Redhead Pond was not found in 2007 despite targeted searches. In addition, the species was not found along the northern half of the Lake Pond shoreline where it had been formerly located. It is not possible to determine how much of this decline may be as a result of natural fluctuations. Given the dynamic nature of its habitat, population fluctuations are normal with this species and can occur such as in Ontario populations where it has been observed that the number of stems can naturally fluctuate from one year to the next (Michael Oldham, pers. comm. December 2006). It is thus possible that such naturally ephemeral colonies could become established and then disappear from time to time.

[3] G: global rank; N: national rank; S: subnational rank; 1: critically imperiled; 2: imperiled; 5: secure

Table 1 : Characteristics of current American Water-willow occurrences in Canada[4]

Site (province)	Land Tenure	Number of colonies	Area occupied	Total number of stems (year)
1.Mille Iles River (Que.)	Provincial Public Land;	5	2,6 km^2	25,323,757 (2007)[5]
2.Ile Rock (Que.)	Provincial Public Land; also a "Plant Habitat" under Que. jurisdiction	1	0.09 ha	73,686 (2007)[6]
3.Hill Island (Ont.)	Provincial Public Land	24	500m^2	~ 59,000 stems (2008)[7]
4.Point Pelee National Park (Ont.)	Federal Public Land; National park	10	158 m^2	30,042 (2007)[8]
5. Rivière Godefroy (Que.)	Provincial Public Land; also a "Plant Habitat" under Que. jurisdiction	1	0.63 ha	> 25,000 (1995)[9]
6.Dufferin Island, Niagara River (Ont.)	Provincial Public land	1	144 m^2	~ 5,000 (2006 and 2007)[10]
7.Grenadier Island (Ont.)	Provincial Public Land	1	120 m^2	3,600 (2008) [11]
8.Pelee Island (Ont.)	Provincial Public Land	1	1 m^2	~150 (2007)[12]
9.Lyon's Creek, (Ont.)	Provincial Public Land	1	0.12 km^2	Unknown (1970 and 2005)
10. Leamington	Federal, Provincial and Municipal Public Land	1	2 m^2	Unknown, 2009

[4] NHIC, 2010; CDPNQ, 2006
[5] Bisson et Gauvin, 2008
[6] Dixon et Asch, 2008
[7] Thompson, 2008
[8] Jalava et al. 2008
[9] Sabourin et al. 1995
[10] Michael Oldham, pers. comm. September 2006 and November 2007
[11] Thompson, 2008
[12] Sam Brinker, pers. comm.., October 2007

1.4 The needs of American Water-willow

1.4.1 Biological and habitat needs

This herb is normally found along the shores of rivers, streams and shallow lakes on a substrate of gravel, sand or organic material. The American Water-willow can survive in zones that are highly exposed to the action of waves (Varga, 1984) and is limited to open habitats offering little or no competition from other species. This trait explains the plant's tendency to form monocultures in which very few other floating, submerged or emergent species are found.

The American Water-willow survives equally well just above ground water level as it does in up to 1.2 m of water. Its roots always remain below the ground water, even when water levels fall to their lowest (Gauvin, 1983; Varga, 1984). It appears that the herb's survival in the dynamic environment of streams in eastern North America is aided by its solidly rooted underground structure and its ability to regenerate in the wake of storms. The dynamic environment in which the American Water-willow grows suggests that its life cycle is probably adapted to natural phenomena like erosion.

The plant cannot survive in a pH of 5.5 or lower (Koryak and Reilly, 1984; Adams et al., 1973). American studies have shown that hard water and an abundance of organic material encourage the growth of American Water-willow (Hill, 1981; Howell, 1975).

The American Water-willow can propagate through vegetative reproduction, with new plants developing from its rhizome or from axillary buds that form on the stem. Rhizome-based propagation occurs when there is an accumulation of soil, whereas axillary buds are produced most frequently in the absence of sedimentation.

Sexual reproduction can also play a significant role in the propagation of this aquatic plant (Penfound, 1940). Recently, the species has been successfully cultivated using two seedlings removed from their natural environment by the Institut de recherche en biologie végétale at the Montreal Botanical Garden and the Université de Montréal (Guy Jolicœur, pers. comm. with Stéphanie Pellerin, November 2006).

1.4.2 Limiting factors

In Canada, the American Water-willow grows at the northern limits of its range. Climate appears to be the primary factor that limits the distribution of the American Water-willow in Canada (Gauvin, 1983; Jolicœur and Couillard, 2007). Dispersal and pollution may also play a role (White 2000) but there is no direct evidence for the type of impact water pollution may have on Canadian populations. Flooding and drought can occur at most sites of American Water-willow, but their effects are not fully understood and do not appear to be uniform (see section 1.5.2.1). According to White (2000), the American Water-willow may be ephemeral at some sites.

1.5 Threat Identification

Table 2 and the associated section present all the known or presumed threats to the survival of the American Water-willow and its habitat. At present, the species occurs at only ten known sites in Canada. Information pertaining to the Grenadier Island, Lyon's Creek, Pelee Island and Leamington sites is not included in this table due to lack of available information.

The definitions of the terms used in the threat table are as follows:

- **Causal certainty:** reflects the degree of evidence that is known for the threat - the stronger the evidence, the higher the rating (High: available evidence strongly links the threat to stresses on population viability; Medium: there is a correlation between the threat and population viability e.g. expert opinion; Low: the threat is assumed or plausible).

- **Severity**: reflects the population-level effect (High: very large population-level effect, Moderate, Low, Unknown).

- **Level of Concern**: signifies that managing the threat is of (high, medium or low) concern for the recovery of the species, considering the information in the table.

1.5.2 Description of threats

The threats to the survival of the American Water-willow are linked mainly to changes in its habitat, including changes in water regime, loss of habitat resulting from natural processes such as erosion and from human activity such as dredging and infilling. Competition from invasive plant species in the American Water-willow's habitat and human-induced trampling, have a high impact at certain sites and also constitute threats to the population's integrity.

Table 2. Threats to American Water-willow in Canada

Threat		Threat Information	Mille Îles River (Que.)	Ile Rock (Que.)	Hill Island (Ont.)	Point Pelee National Park (Ont.)	Rivière Godefroy (Que.)	Dufferin Island (Ont.)
1	Changes to water regime	Threat Information						
Threat Category	Changes in natural processes	Occurrence	Current	Anticipated	Current	Current	Current	Current
General Threat	Changes to water regime	Frequency	Continuous	Unknown	Continuous	Recurrent	Seasonal	Continuous
		Causal Certainty	Low	Unknown	Low	Low	Low	Low
Specific Threat	Flooding or drying out	Severity	Low	Unknown	Moderate	Low	Low	Moderate
Stress	Mortality	Level of Concern	Medium	Low	Low	Low	Low	Medium
2	Erosion	Threat Information						
Threat Category	Habitat loss or degradation	Occurrence	Current	Unknown	Unknown	Anticipated	Anticipated	Current
General Threat	Erosion and dredging	Frequency	Recurrent	Unknown	Unknown	Unknown	Unknown	Recurrent
		Causal Certainty	Low	Unknown	Unknown	Unknown	Unknown	Medium
Specific Threat	Changes to shorelines, rivers or lake beds;	Severity	Low	Unknown	Unknown	Unknown	Unknown	Moderate
Stress	Removal of substrate, substrate instability;	Level of Concern	Low	Unknown	Unknown	Low	Low to medium	Medium
3	Alien invasive plants	Threat Information						
Threat Category	Exotic invasive species	Occurrence	Anticipated	Anticipated	Anticipated	Current	Anticipated	Anticipated
General Threat	*Phragmites* and other plant sp.	Frequency	Unknown	Unknown	Unknown	Continuous	Unknown	Unknown
		Causal Certainty	Unknown	Unknown	Unknown	Medium	Unknown	Unknown
Specific Threat	Resource competition, displacement	Severity	Unknown	Unknown	Unknown	High	Unknown	Unknown
Stress	Reduced population size, Local extinction	Level of Concern	Low	Low	Low	High	Low	Low

Threat		Threat Information	Mille Îles River (Que.)	Ile Rock (Que.)	Hill Island (Ont.)	Point Pelee National Park (Ont.)	Rivière Godefroy (Que.)	Dufferin Island (Ont.)
4	Trampling	Threat Information						
Threat Category	Habitat loss or degradation	Occurrence	Current	Current	Anticipated	Current	Anticipated	Unknown
General Threat	Trampling by human activities	Frequency	Seasonal	Seasonal	Seasonal	Seasonal	Unknown	Unknown
		Causal Certainty	Low	Medium	Low	Low	Unknown	Unknown
Specific Threat	Destruction, uprooting	Severity	Low	Moderate	Low	Low	Unknown	Unknown
Stress	Mortality , local disappearance	Level of Concern	Low	High	Low	Low	Low	Unknown
5	Infilling	Threat Information						
Threat Category	Habitat loss or degradation	Occurrence	Current	Unknown	Unknown	Unknown	Unknown	Anticipated
General Threat	Urban development	Frequency	Recurrent	Unknown	Unknown	Unknown	Unknown	Unknown
		Causal Certainty	High	Unknown	Unknown	Unknown	Unknown	Unknown
Specific Threat	Infilling of wetlands	Severity	Moderate to low	Unknown	Unknown	Unknown	Unknown	Unknown
Stress	Mortality; Local disappearance	Level of Concern	Medium	Unknown	Low	Unknown	Unknown	Low
6	Grazing	Threat Information						
Threat Category	Natural process and activities	Occurrence	Anticipated	Unknown	Current	Unknown	Current	Unknown
General Threat	Grazing by deer	Frequency	Unknown	Unknown	Seasonal	Unknown	Seasonal	Unknown
		Causal Certainty	Unknown	Unknown	Low	Unknown	Low	Unknown
Specific Threat	Loss of photosynthetic area (leaves) and seeds	Severity	Unknown	Unknown	Low	Unknown	Low	Unknown
Stress	Reduced pop. size /viability	Level of Concern	Low	Unknown	Low	Unknown	Low	Unknown
7	Water quality	Threat Information						
Threat Category	Pollution	Occurrence	Current	Unknown	Anticipated	Unknown	Anticipated	Unknown
General Threat	Waste water (urban and rural)	Frequency	Continuous	Unknown	Unknown	Unknown	Unknown	Unknown
		Causal Certainty	Low	Unknown	Unknown	Unknown	Unknown	Unknown
Specific Threat	Degradation of water quality	Severity	Low	Unknown	Unknown	Unknown	Unknown	Unknown
Stress	Mortality; local disappearance	Level of Concern	Low	Unknown	Low	Unknown	Low	Unknown

Additional information : The Grenadier Island stand is partially cut to accommodate an intake line for cottage water supply. Hill Island had one site browsed by deer.

1.5.2.1 Changes to water regimes

The effects of flooding and drought on American Water-willow populations are not fully understood and available information about this threat vary greatly on the nature of its impact on the plant's survival. Such effects on populations are sometimes noted as positive and sometimes as negative.

The operation of the dam built on Dufferin Island (near the Niagara River) likely affects the survival of downstream American Water-willow populations by creating regular successive periods of drying out and inundation. This may have been the cause of an apparent decline in numbers at the Dufferin island site (Michael Oldham, pers. comm., December 2006).

The St. Lawrence River experiences annual fluctuations in water levels of 60 to 90 cm in the Thousand Islands area. Plants were observed in September with previously flooded roots left high and dry. This could be a compounded problem if roots are left exposed to more severe cold and freezing in winter under low water conditions (OMNR, 2009b).

In the Mille Îles River, in Quebec, annual monitoring of the populations between 2004 and 2007 revealed that very little about the direct effect of the modifications to the water levels is known since, with a low water level, both decreases (2005) and increases (2007) in American Water-willow populations (Bisson et Gauvin, 2008) were observed.

According to White (2000) the American Water-willow populations can be seriously affected by natural changes in water regimes. Likewise, water regime changes caused by human activity can also have major consequences for this plant. A recent study in the U.S. (Strakosh et al., 2005), demonstrated that the American Water-willow is impacted by the negative effects of flooding more than those of drought. In other studies, it appears that the growth of American Water-willow was in no way affected by disturbances caused by flooding (Fritz et al., 2004).

Overall, these studies show that the effects of flooding and drought on American Water-willow are not uniform.

1.5.2.2 Erosion

Habitat loss related to erosion can be a medium to low threat that can be attributed to natural causes in most cases, but arises from human activities in certain places. In Ontario, the shores of Lake Erie bear the brunt of storms, waves, wind and winter ice, which cause erosion contributing to American Water-willow habitat loss (White, 2000). Regular operation of the dam at Dufferin Island has modified the nature of the river bed at the site. Shoreline erosion and habitat succession may have eliminated the American Water-willow at two of the three Pelee Island sites (White, 2000) and may affect the newly discovered site. Wave action noted at the Hill Island colony may be uprooting portions of colonies. The waves may be caused by heavy boat traffic and/or wind (OMNR, 2009b).

It is anticipated that these natural threats could likely intensify as a result of climate warming. Anticipated changes in the water level of the Great Lakes will also likely pose a considerable threat to the species and will need to be examined in greater depth (Michael Oldham, personal communication, November 2007). In Quebec, certain sectors along the Mille Îles River have suffered extensive erosion following human activities such as wall building along the shoreline and other kinds of alterations to the natural banks (Isabelle Mathieu, pers.comm., fall 2006).

1.5.2.3 Alien invasive species

In Point Pelee National Park, the Common Reed (*Phragmites australis*) and the Hybrid Cattail (*Typha X glauca*) effectively reduce the amount of edge habitat where American Water-willow is most often found (Michael Oldham, personal communication, 2007). Reed Canary Grass (*Phalaris arundinacea*) and shoreline shrubs also tend to hem in the area that can be occupied by American Water-willow higher up on a bank. The American Water-willow can establish itself higher on the bank only when Reed Canary Grass is absent. In the areas where American Water-willow has disappeared in Point Pelee National Park, Common Reed now grows in a monoculture. It may very well be responsible for the local disappearance of American Water-willow at one pond in the national park (M^{c}Kay pers. comm.).

In southern Ontario especially, invasive species like the Common Reed, Hybrid Cattail, Purple Loosestrife (*Lythrum salicaria*) and Yellow Flag (*Iris pseudacorus*) can constitute a serious threat (Michael Oldham, personal communication, December 2006). There is always a potential risk of other invasive species becoming established and increasing the cumulative impact of invasive species on the American Water-willow.

1.5.2.4 Trampling by hunters, canoeists and kayakers

Trampling by hunters, canoeists and kayakers mainly affects the Ile Rock population of American Water-willow. Hunters visit the island in the fall, while kayakers and canoeists are more likely to picnic there during spring, summer or fall and intensely use the area for the practice of this sport. Moderate impacts on the population are expected (P.Asch, pers. comm.) if recreational use of the area encompassing the island remains at same level. In the fall, the plants have already produced their rhizomes and seeds. According to Penfound (1940), these seeds may have even germinated by fall, which would render these seedlings vulnerable to trampling.

The American Water-willow population at Point Pelee National Park may also suffer the negative effects of trampling by canoeists and kayakers. However, it is also possible that the occasional disturbance caused by this trampling may in fact keep the habitat clear from the encroaching Common Reed. As such, concern for this particular threat at this location is considered low at this time.

1.5.2.5 Infilling

Habitat loss caused by infilling of river shores to expand urban areas constitutes a serious threat that has already been instrumental in the extirpation of seven of the twelve American Water-willow populations previously found in Quebec. Evidence on the subject comes mainly from sites where the species occurred in Quebec, along the St. Lawrence Seaway and in the greater Montreal area (Jolicœur and Couillard, 2007). This threat still exists in the Mille Îles River area as colonies exist in close proximity to well-developed urban areas. Little is known of the historical importance of this threat in Ontario. It is presumed that many populations have disappeared due to the destruction of their habitats as a result of human activity.

1.5.2.6 Grazing by wild animals

Along the Rivière Godefroy, intensive grazing on American Water-willow tips by White-tailed Deer (*Odocoileus virginianus*) has been observed. The browsing observed at Rivière Godefroy showed that stems were stimulated to sprout again. On the other hand, the plants observed showed very little fruit, probably indicating a decline in reproductive success.

At one Hill Island colony (one of 24 present), approximately 20-25 % of the stand was affected by deer browsing (Thompson, 2008). Grazing may have contributed to the loss of the American Water-willow population in Rondeau Provincial Park (Ont.), (an historic occurrence), since the number of White-tailed Deer was, at one time, very high there.

1.5.2.7 Degradation of water quality

According to U.S. studies (Hill, 1981; Howell, 1975), hard water and an abundance of organic matter encourage the development of the American Water-willow. On the other hand, the species is harmed by industrial pollution (Stuckey and Wentz, 1969) particularly acid effluents from mines (Adams et al., 1973; Koryak and Reilly, 1984). The American Water-willow cannot survive in water with a pH of 5.5 or lower. No specific information regarding this threat exists for Canadian sites.

1.6 Actions Already Completed or Underway

In 1983, a detailed study of the status and management of the American Water-willow population and its habitat was conducted at Point Pelee National Park, and follow-up monitoring was conducted in 1988, 1989, 1991, 1999 and 2007. In 1990, the majority of the Ontario American Water-willow populations were inventoried and a summary report on their status was produced (Oldham, 1990).

In 1998, the American Water-willow was officially designated as Threatened in Quebec and the Rivière Godefroy and Ile Rock sites were recognized as "plant habitats" under the

Act respecting threatened or vulnerable species of Quebec [13]. These sites thus gained a high degree of protection, because most human activities are prohibited in such habitats. A Quebec conservation plan for the conservation of the American Water-willow at actual sites of occurrence in Quebec was drawn up in 2004 by the ministère du Développement Durable, de l'Environnement et des Parcs du Québec and has recently been updated (Jolicœur and Couillard, 2007).

In 2002 and 2003, an unsuccessful attempt was made at relocating American Water-willow on Île Turcotte (Saint-Eustache) on the Mille Îles River. From 2004 to 2008, American Water-willow populations on the Mille Îles River were monitored by the group Éco-Nature (Bisson et al., 2004, 2005, 2006, and Bisson et Gauvin, 2008). This group is heightening awareness of American Water-willow on the part of fishers and other Mille Îles River users through various means. Direct contact was also made with landowners at some sites to suggest proper management practices regarding shoreline use with regard to the American Water-willow occurring there. In 2005, the Rivière Godefroy habitat for this protected species was expanded and a notice and a chart were published in the *Gazette officielle du Quebec*[14].

In 2006, in Ontario, the Niagara Parks Commission conducted a survey of Dufferin Island and undertook two initiatives to improve American Water-willow habitat and to establish an educational program for 2007. In 2007, surveys of known American Water-willow sites were conducted at Ile Rock, Dufferin Island, Lyon's Creek, Rondeau Provincial Park, Middle Island, Point Pelee National Park and several sites on Pelee Island.

In 2008, two new sites were discovered in Ontario's Thousand Islands region, (near Grenadier and Hill islands) in the vicinity of St.Lawrence Islands National Park and a thorough survey of several neighboring islands was conducted in 2008 after the inital plants were discovered. In 2009, surveys were carried out at Long Point National Wildlife Area on Lake Erie and no plants were observed in apparently suitable habitat where it historically occurred.

Current initiatives for the conservation of this species include a project to designate the Mille Îles River site as the habitat of a protected species. This work is being developed by the Quebec ministère du Développement durable, de l'Environnement et des Parcs (MDDEP).

[13] Gazette officielle du Québec, 1998. n° 17, 130e année , page 2152. (*An Act respecting threatened or vulnerable species of Quebec*).
[14] *Gazette officielle du Québec*, 2006. n° 21, 138e année, page 2177. (L.R.Q., c. E-12.01)

1.7 Additional American Water-willow Information Requirements

1) To date, there is no exact information that enables an evaluation of the long-term viability of a population. A mechanism to determine what is considered to be a self-sustaining viable population size would inform future recovery initiatives.

2) There is a need to document threats and to verify the significance of these threats, at each site, based on credible evidence.

3) Surveys still need to be conducted on sites where American Water-willow has occurred historically and at sites where there is potentially suitable habitat.

4) The extent of variation in population dynamics needs to be studied, so as to determine the rate of natural population fluctuations.

5) Methods of propagating, transplanting and establishing individual plants are to be refined if augmentation of existing colonies is to be realized. Such an activity would need to be based on a study evaluating pertinence and technical feasibility of transplanting individuals at appropriate sites.

6) Most of the references consulted for information on the species' ecological needs and ecological role come from American sources. There seem to be no studies of this type on Canadian populations. The physico-chemical parameters of water in Canadian colonies of the American Water-willow remain unknown. A detailed characterization of the micro-habitats occupied by this species in this country is required.

7) First Nation communities have maintained local ecosystems for generations through the use of community Traditional Ecological Knowledge. It is important to gather and share Traditional Ecological Knowledge from Knowledge Holders to others as a means for species and ecosystem protection and recovery. Traditional Ecological Knowledge and Science can, together, better inform assessment, monitoring, and recovery of the ecosystems that support specific species at risk.

8) Since the species produces numerous rhizomes that interconnect and thereby anchor plants firmly in the substrate, it is possible that each site actually consists of only a few clonal individuals. Knowledge of the relative importance of the rate of reproduction by seeds (sexual) as opposed to rhizomes (vegetative) would be useful in the long term. In order to assess the long term viability of any colony, its genetic structure should be analyzed in order to assess the level of cloning (asexual reproduction) occurring within it.

9) Little is known about the role of sexual reproduction in the propagation of the species and about the viability of the seeds produced by plants. Similarly, modes

of pollination and seed dispersion at our latitudes are poorly documented. The largest Quebec populations studied in 2006 were observed to have an abundant production of fruit, but the role of fruit in the species' maintenance and expansion is not known (Jolicœur and Couillard, 2007). Information on fertility is also lacking for the Ontario populations.

2. POPULATION AND DISTRIBUTION

2.1 Population and Distribution Objectives

The population and distribution objectives are: to maintain (and if possible increase) the current number of individuals, to maintain the actual number of locations (10), and to prevent the decline in the quality of habitat.

2.2 Broad Strategies and Approaches to Recovery

Recovery planning involves considering the threats and challenges associated with meeting the recovery objectives for the species. Recovery success requires close cooperation among the local participants who head the implementation of recovery actions.

Broad strategies and approaches for achieving the population and distribution objectives for American Water-willow are presented in Table 3. These priorities will be revisited in the action planning stage.

Table 3. Broad strategies and approaches for American Water-willow recovery

Priority	Threat/ Concern Addressed	Broad Strategy	Outcome
Approach 1: Engage landowners and managers of sites that neighbour or harbour the American Water-willow populations in stewardship action and protection			
Medium	Habitat loss	Coordinate and encourage the actions of governments, First Nations, and NGOs with respect to population surveys, communications with landowners / land managers, Traditional Ecological Knowledge, and protection activities.	A stewardship guideline and management practices is produced and stewardship measures (including briefings of landowners and land managers whose property includes or borders critical habitats) are implemented. Encourage the gathering and transfer of Traditional Ecological Knowledge from Knowledge Holders to others.
Approach 2: Enhance current knowledge of the distribution and abundance of the American Water-willow populations throughout the species' current and historic range			
Medium	Knowledge gap	Revisit all sites of historical occurrence that continue to present potential for supporting this species.	Inventories of sites of known historical occurrence that continue to present a potential for supporting this species.
Medium	Knowledge gap	With the possible ephemeral nature of the species, seek opportunities to search for 'new' American Water-willow colonies in suitable habitats along the Ontario shorelines of the St. Lawrence River, the length of Niagara River, and on the Canadian site of Lake Erie.	Identification of areas of suitable habitat where in-depth surveys can take place and inventories of all potential sites started.
Approach 3: Determine the biological requirements for the maintenance and growth of American Water-willow populations and document natural range of variability in population abundance			
Medium	Knowledge gap	Characterize the American Water-willow's habitat in Canada.	Characterization of the American Water-willow's habitat in Canada .
Low	Knowledge gap, Pollution	Measure water quality parameters at current sites	Acquisition of knowledge of the required physico-chemical characteristics of water for the maintenance and growth of American Water-willow populations.

Priority	Threat/ Concern Addressed	Broad Strategy	Outcome
Medium	Knowledge gap (pop. dynamics)	Identify the natural rhythm of fluctuation in American Water-willow populations with a view to determining whether the population is at risk or is simply experiencing normal variations.	A completed report concerning population dynamics of American Water-willow populations.
Low	Knowledge gap	Assess if sexual reproduction is occurring by looking into insect pollination and seed dispersal.	A completed study on the conditions required for pollination and dispersion.
Approach 4: Determine the pertinence and feasibility of increasing the number of individuals (augmentation) at actual sites, once knowledge about the ecology of this species has grown to the required levels and techniques of sowing and transplantation have become sufficiently refined;			
Medium	Knowledge gap, Habitat loss	Increase knowledge to determine if augmentation actions are appropriate.	Informed knowledge base to determine if augmentations are appropriate.
Medium	Habitat loss Knowledge gap	For sites recommended for augmentation, identify the specific conditions necessary to proceed with population restoration.	As required, identification of conditions conducive to augment the number of individuals at specific populations.
Medium	Knowledge gap	Develop effective transplantation or sowing technique.	Development of an effective transplantation or sowing technique.
Medium	Habitat loss	Augment the American Water-willow plants in current sites in accordance with a rigorously controlled experimental set-up.	Augment, where suitable and needed, the number of individual American Water-willow plants in actual sites.
Approach 5: Determine the degree of genetic diversity both within each population and between different American Water-willow populations.			
Low	Knowledge gap	Assess the relative extent of vegetative and sexual reproduction between Canada's two main populations.	Acquisition of additional knowledge about the relative extent of vegetative and sexual reproduction among Canada's two main populations by.
Low	Knowledge gap	Perform genetic testing to determine the differences among, and within, the main Canadian populations.	Perform genetic testing to determine the differences among Canadian populations, and the variability within

Priority	Threat/ Concern Addressed	Broad Strategy	Outcome
			populations.
Approach 6: Determine population viability			
Medium	Knowledge gap	Determine viability of American Water-willow populations in Canada.	Determination of what is a viable population.
Medium	Knowledge gap	Establish population targets for each sites.	Have a population abundance target established for each site.
Approach 7: Document threats more precisely			
Medium	All threats, Knowledge gap	Document more precisely the nature and extent of existing threats at known and recently discovered sites.	A completed report describing the threats affecting known populations (new and old ones).
Medium	All threats	Initiate the implementation of site-specific actions to address the highest priority threats.	Reduce the impacts of most severe threats at each site.

2.3 Performance measures

1) There will be at least 10 American Water-willow populations in 10 years.
2) The number of individuals will have been maintained or increased.
3) An increase in site protection through stewardship and other management initiatives will be noted by 2016: approach 1.
4) At least 60 % of landowners neighbouring the colonies will have been made aware of this species by 2016: approach 1.

2.4 Critical Habitat

Under SARA, critical habitat is defined as the habitat necessary for the survival or recovery of the listed species, and is meant to represent the habitat needed by the species to meet the stated population and distribution objectives. The critical habitat identified here is based on the best available information at this time.

2.4.1 Critical Habitat Identification

Critical habitat is identified for each of the 10 extant populations of American Water-willow. The critical habitat identified here is based on the best available information at this time, the quality of which varied from site to site. Consequently, slightly different methods were used to identify critical habitat at each site. For some sites, critical habitat has been identified comprehensively, with sufficient occupied and unoccupied suitable habitat included to allow for metapopulation dynamics to occur. For other sites, an occupancy-based approach was used, in which only the suitable habitat immediately around existing plants was identified as critical habitat.

In addition, for all but one site, the entire polygon (as depicted in the maps to follow) are critical habitat. For the site at Point Pelee National Park, critical habitat is only those parts within the defined area where specified biophysical attributes are found.

The biophysical attributes of the critical habitat for this species are defined as sheltered coves, shoals and shores of rivers, streams, ponds and lakes, where they form almost single-species colonies. The soil substrates used by American Water-willow varies from clay to sand to gravel and even rock. The species also tolerates considerable fluctuation in water levels and can even be found on non-submerged, though very wet soils adjacent to water bodies (adapted from Jolicœur and Couillard 2007).

Critical habitat does not include existing human infrastructures (sidewalks, wharves, bridges).

Details concerning the critical habitat identification for each of the 10 populations is as follows:

Leamington

The location of the critical habitat for the American Water-willow at the Leamington Municipal Marina, within the town of Leamington, is shown in Figure 3.

It is located within the rip-rap shoreline on the east side of the marina at the following approximate coordinates : southwest limit is at Latitude 82° 35' 47.45" W and Longitude 42° 1' 34.91" N. Northwest limit is at Latitude 82° 35' 47.37" W and Longitude 42° 1' 35.31" N. Northeast limit is at Latitude 82° 35' 46.83" W and Longitude 42° 1' 35.25" N. Southeast limit is at Latitude 82° 35' 46.92" W and Longitude 42° 1' 34.85" N.

The critical habitat includes an area of 5 m in all directions from the outside edge of the American Water-willow population which was approximately 2 m long by 1 m wide in 2009. Minimum critical habitat area is therefore 12 m long (parallel to the shoreline) by 11 m wide (perpendicular to the shoreline). The critical habitat includes the area underwater to a maximum depth of 1.1 m or 5 m downslope from the edge of the colony, whichever limit comes first.

Point Pelee National Park

Within Point Pelee National Park, critical habitat for the American Water-willow has been identified as the eastern sand/fine gravel high water mark along the shore of Pond Lake into the lake where the water reaches a depth of 1.1 m, within the area delineated by the bounding box as shown in Figure 4.

Monocultures of Common Reed within this area are excluded from critical habitat identification (American Water-willow cannot successfully compete against this species).

Pelee Island

Critical habitat is located along the southern point of Pelee Island, in Lake Erie, off South Shore road, 200 m west of a marina on a cobblestone shoreline as shown in Figure 5. The critical habitat covers an area of 25 m^2. The approximate coordinates for the two points on the shoreline are as follows : Northwest limit is at Longitude 82° 38' 34" W, and Latitude 41° 44' 32" N. Northeast limit is at 82° 38' 30" W, and Latitude 41° 44' 33" N.

Lyon's Creek

This area is occupied by an almost continuous stand of the American Water-willow. The critical habitat is a 5.5 km stretch of Lyon's Creek and covering 11.7 ha as shown in Figure 6.

Dufferin Island

Dufferin Island is located in a wetland adjacent to the Niagara river, below the Niagara river dam on the west side of the Niagara Parkway. The critical habitat is a 225 m^2 area that is completely occupied by a dense patch of American Water-willow (Figure 7).

Grenadier Island

Grenadier Island is located in the Thousand Islands area. The critical habitat is a 170 m^2 area located on the south shore of the island as shown in Figure 8. Coordinates for the southwestern limit is Longitude 75°52' 59" W, and Latitude 44° 23' 44" N. and for the southeastern limit Longitude 75°52' 59" W, and Latitude 44° 23' 44" N.

Hill Island

Hill Island is located in the Thousand Islands area in Ontario in the vicinity of St. Lawrence Island National Park in Ontario. Eight parcels of critical habitat are identified around the island as shown in Figure 9. For each parcel, critical habitat extends 15 m from the center point of known colonies, along the shoreline and out into the water to allow for population growth. Critical habitat does not extend on to land.

Ile Rock

Ile Rock is an island located in the Lachine rapids between Ile des Soeurs (Nuns' Island) and Ile aux Chèvres (Goat Island) in the St. Lawrence River south of Montreal. The island itself encompasses an area of 0.25 ha.

The critical habitat for the American Water-willow at Ile Rock consists of the shoreline area, extending 10 m away from the shore of the island, on the north and east side of the island as shown in Figure 10. This critical habitat occupies an approximate area of 970m^2.

Mille Îles River

This critical habitat is located in the Mille Iles River, between Terrebonne and Laval Island, north of Montreal in the vicinity of the Rapides du Moulin. This area covers 2,6 km^2. The critical habitat starts from the west at the eastern point of Ile Saint-Jean (Beausoleil park, Terrebonne) at 150 m southwest of the dam on Ile des Moulins and extends 10 km eastward to end at Terrasse Mathieu street (Terrebonne) 500 m upstream from the highway 40 bridge as shown in Figure 11.

Rivière Godefroy

This critical habitat is located on lands that, for the most part, come within the boundaries of the Réserve écologique Léon-Provancher, a conservation reserve located just west of Bécancour and south of Trois-Rivières as shown in Figure 12.

The critical habitat covers a total area of 0.63 ha. It is located on either sides of the Rivière Godefroy in a stand of Silver Maple (*Acer saccharinum*). Rivière Godefroy is a small outlet of Lake St-Paul and a tributary of the St.Lawrence River.

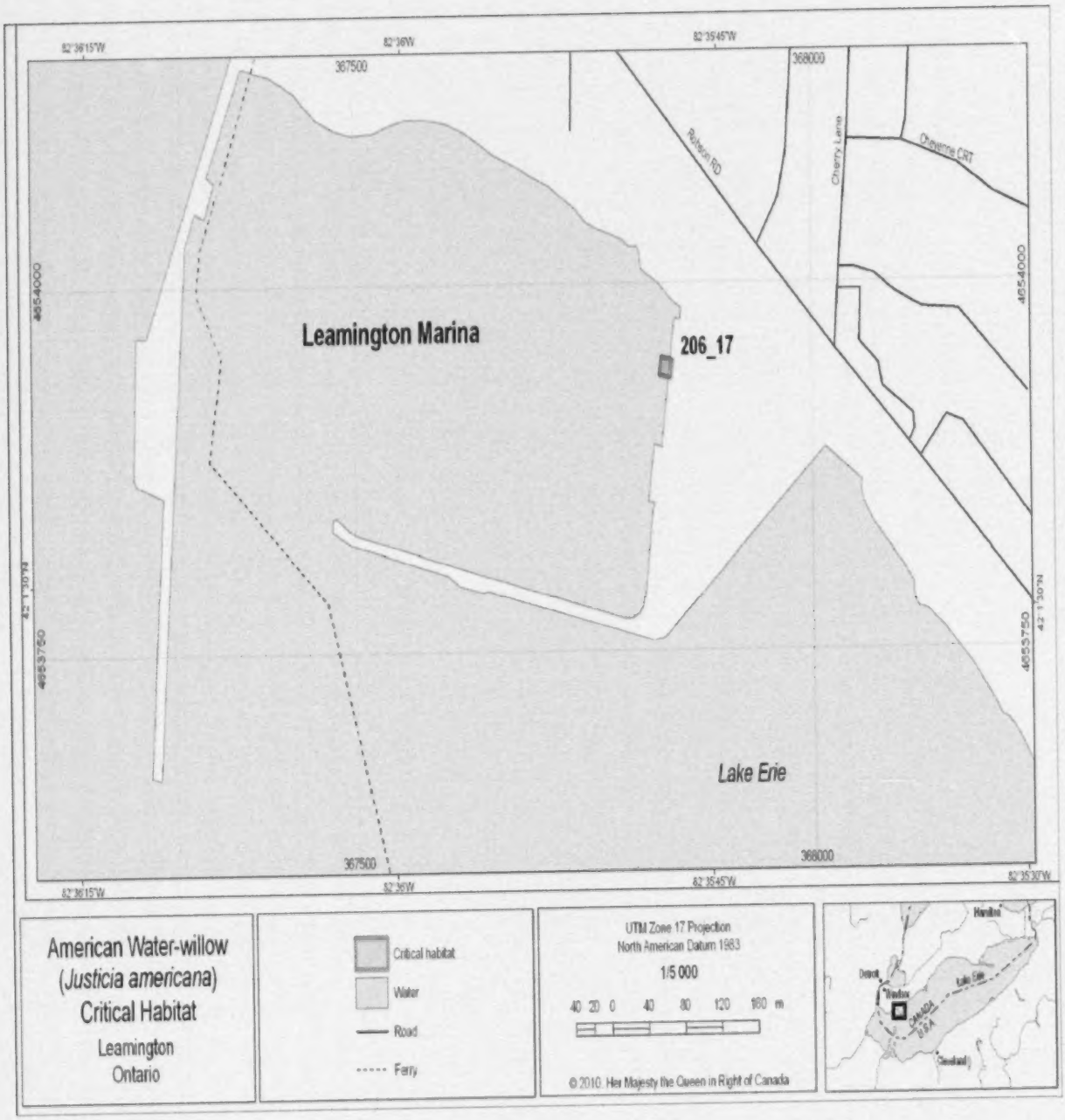

Figure 3. Leamington Critical Habitat

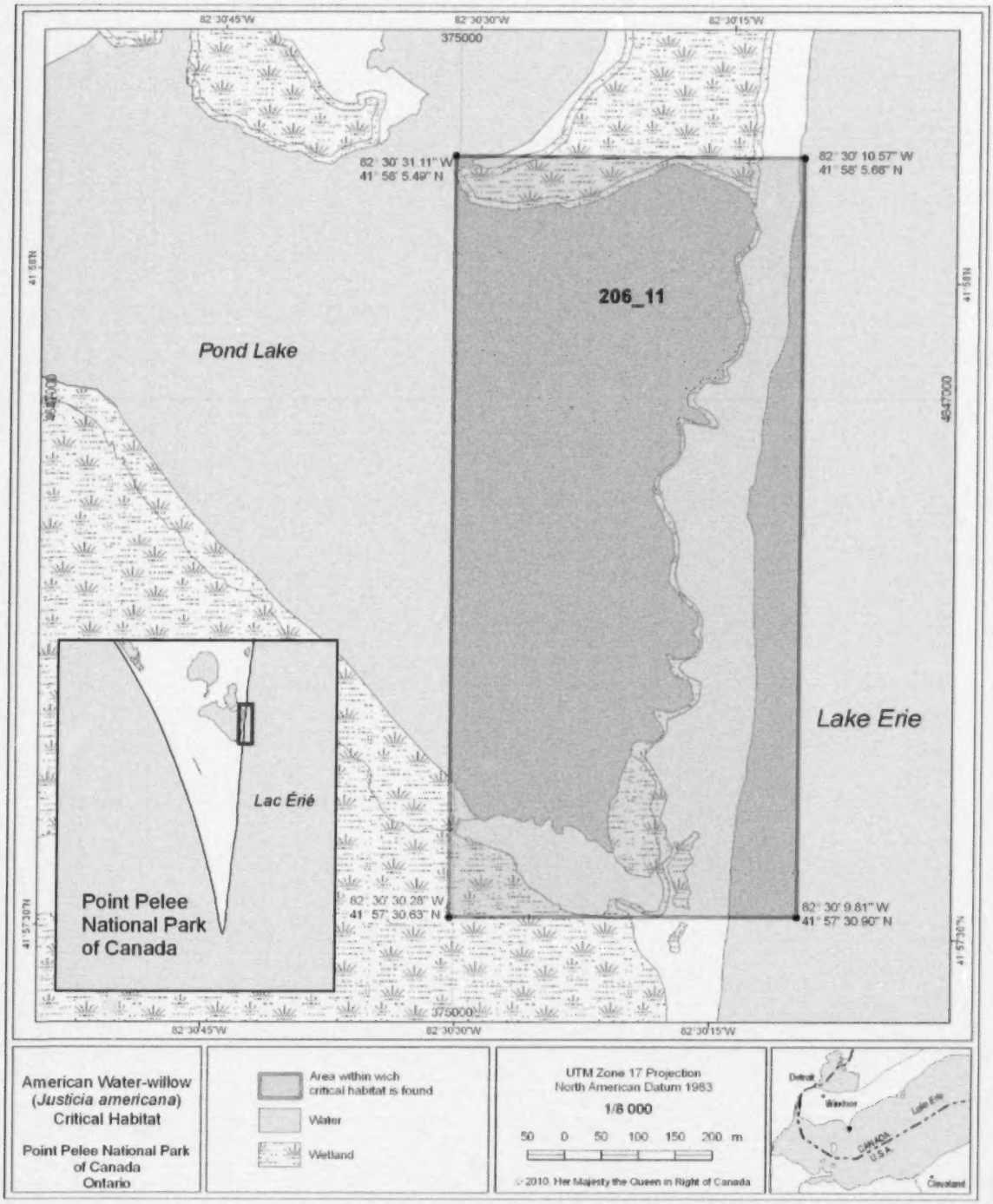

Figure 4. Area within which critical habitat parcel #206_11 is found

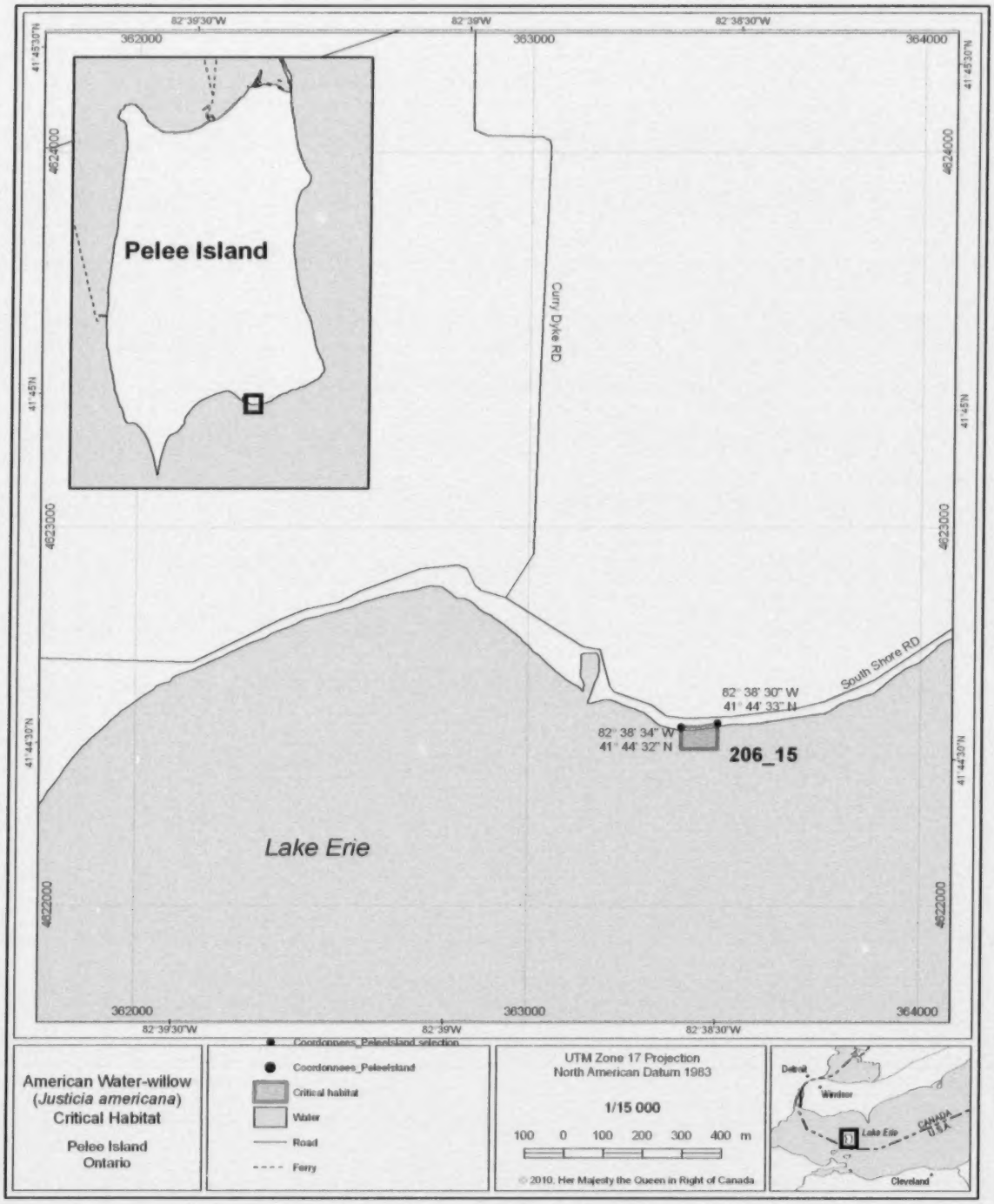

Figure 5. Pelee Island Critical Habitat

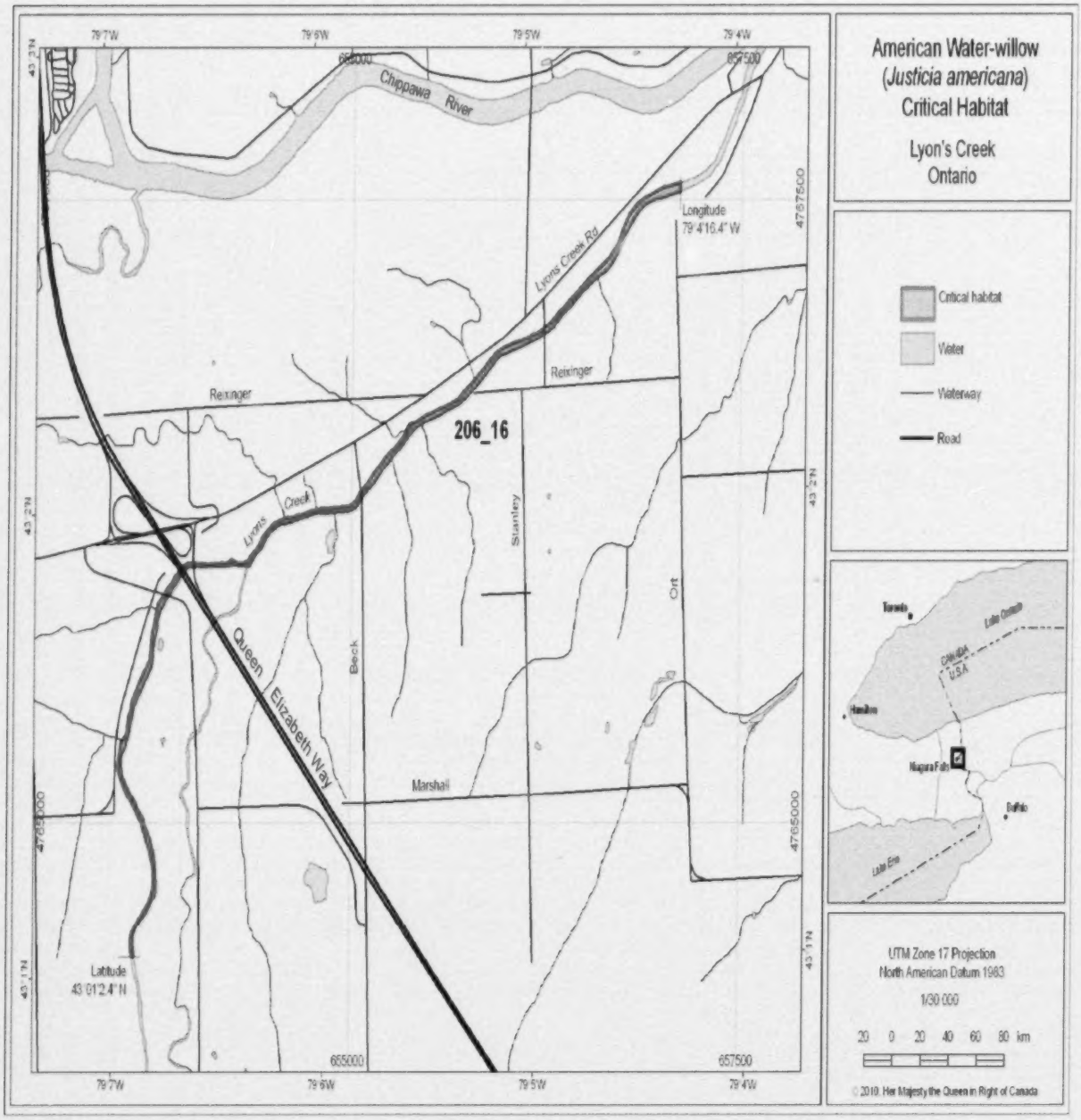

Figure 6. Lyon's Creek Critical Habitat

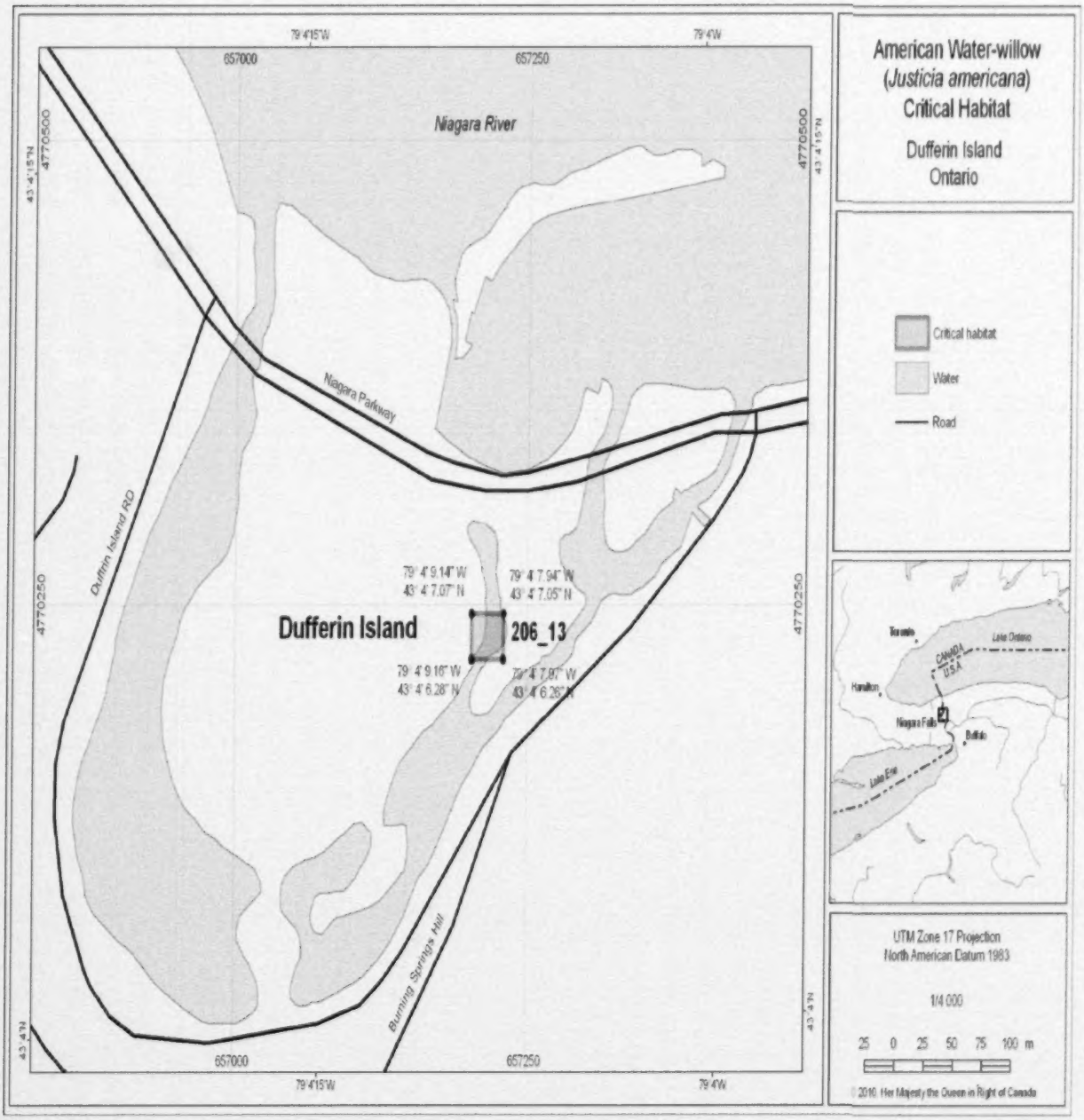

Figure 7. Dufferin Island Critical Habitat

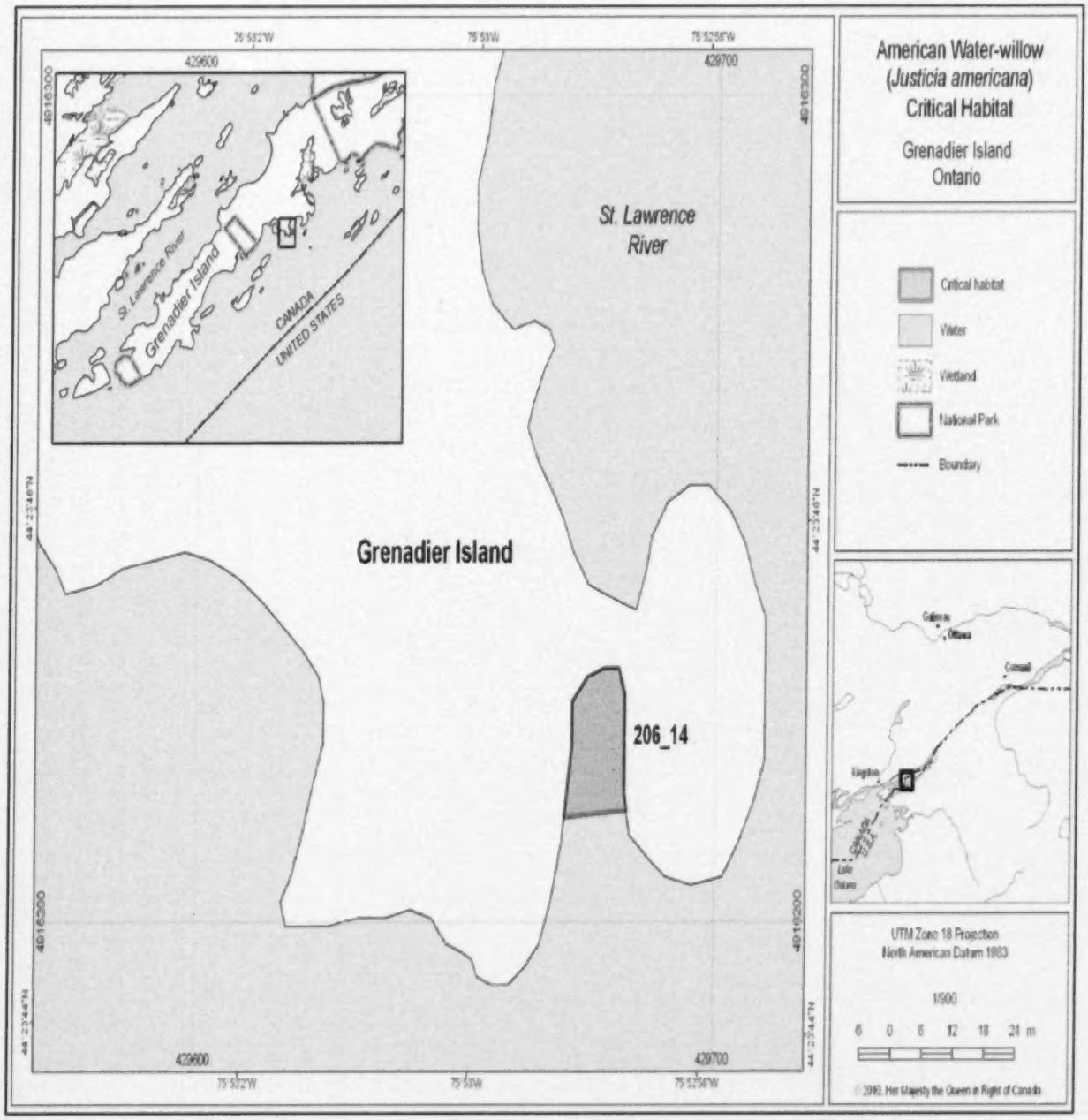

Figure 8. Grenadier Island Critical Habitat

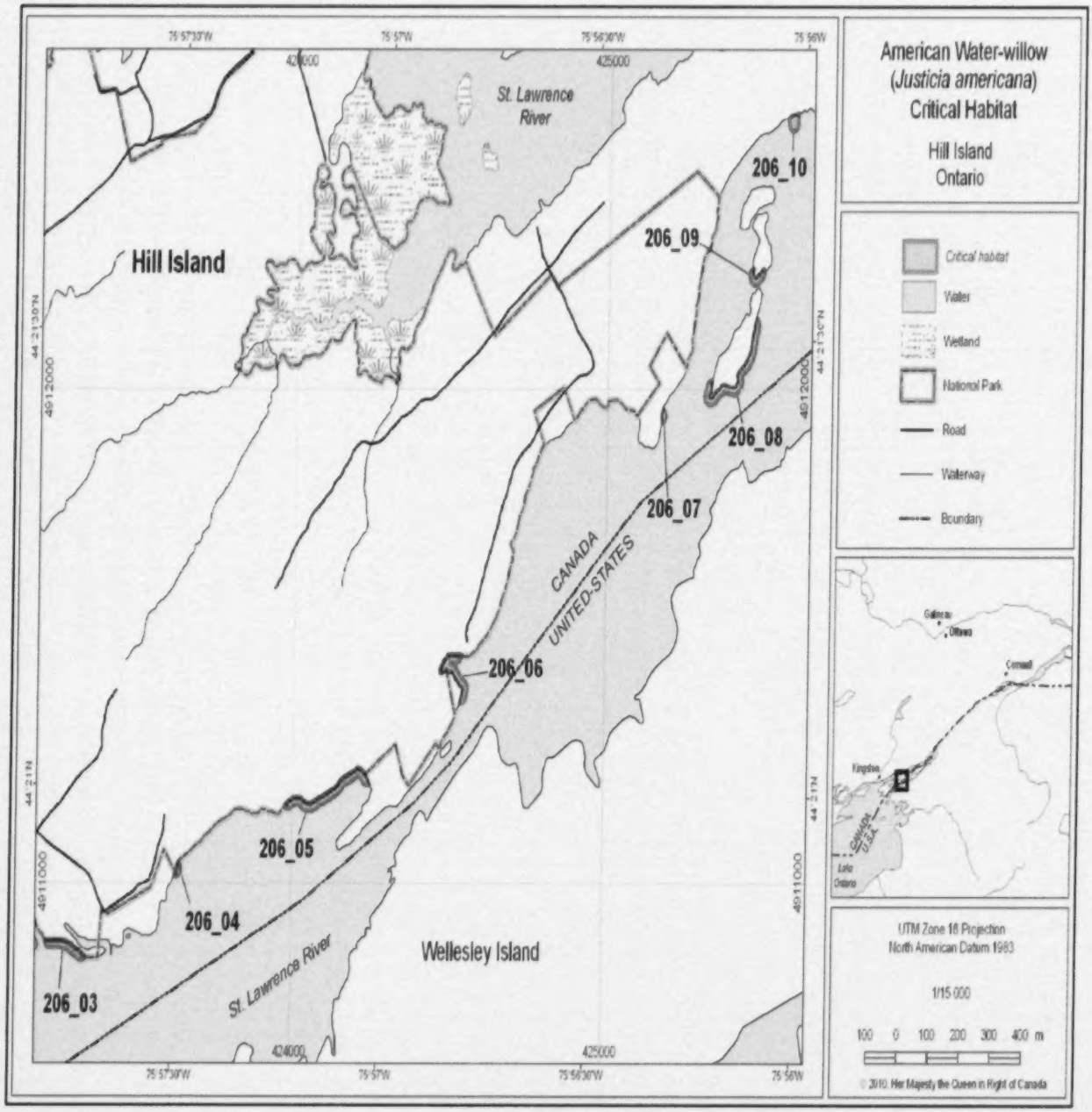

Figure 9. Hill Island Critical Habitat

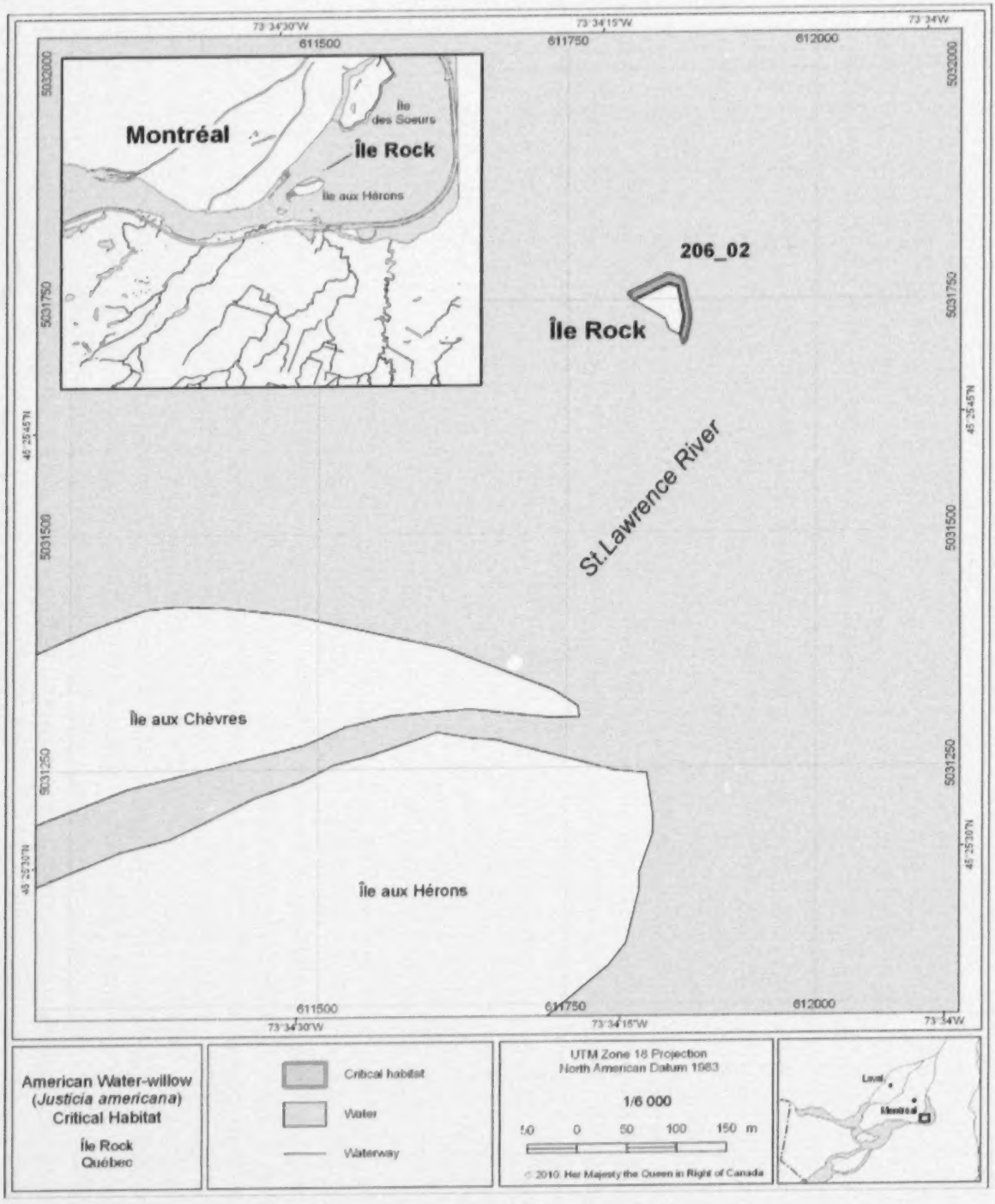

Figure 10. Ile Rock Critical Habitat

Figure 11. Rivière des Mille Iles Critical Habitat

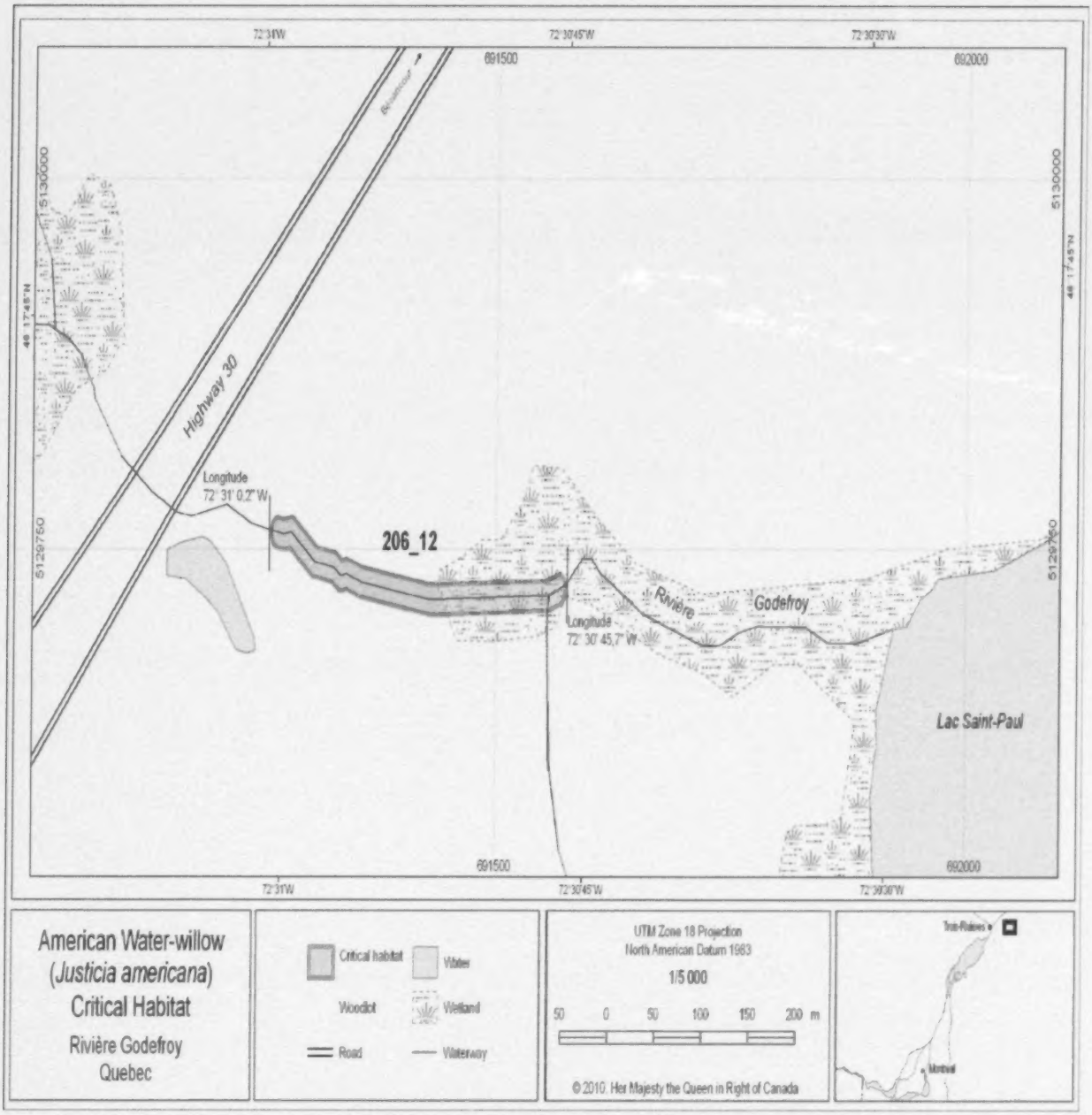

Figure 12. Rivière Godefroy Critical Habitat

2.4.2 Schedule of Studies to Identify Critical Habitat

A schedule of studies is not required at this time, as critical habitat is identified for all known populations.

2.4.3 Examples of activities likely to result in the destruction of critical habitat

Examples of activities likely to destroy critical habitat include infilling and/or dredging/removal of shoreline substrate where seeds and rhizomes can establish. Such activities may occur for the purpose of property expansion or other urban development and where they partially or completely modify (and destroy) existing shoreline substrate and plant habitat. Also, continuous human trampling, such as it is occurring at the Ile Rock shoreline by recreational watercraft users accessing the site, will likely create a modified shoreline structure; this is likely to occur if the current level of human use is maintained. Human-induced changes to water levels and dredging in areas near or at the site of colonies of American Water-willow will likely result in habitat loss. The deliberate introduction of invasive, alien plant species could also affect the availability of habitat for the species.

2.5 Statement on Action Plans

One or more action plans will be completed by January 2016.

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